



**MONTGOMERY COUNTY FIRE AND RESCUE SERVICE  
DRIVER/OPERATOR TRAINING PROGRAM**

## Practical Application Guide Sheet

### Engine: Pump Inspection & Knowledge

**Candidate Performance Competency:** Candidate will perform a daily checkout of the pump and associated components; including the main pump, pump operation, foam systems, fire hose, nozzles, and appliances.

- Candidate will demonstrate a thorough knowledge and understanding of the capabilities of the systems common to various breeds of Montgomery County Engine Companies, including compressed air foam, primers, hose loads, and appliances.
- During the physical checkout, the candidate will explain weekly and monthly maintenance procedures.
- The exact sequence of steps as listed in this PAGS are not critical, however the candidate must approach the inspection in methodical and logical manner.
- All candidates will be tested on all types of foam and primer systems commonly found on MCFRS apparatus and described within the Engine Trainee Book. In the physical absence of a system at the test, the Evaluator will conduct the testing in a format that verifies the Candidate's knowledge to the extent possible. For example, if a Crimson engine is used for the test, the Candidate must also have a working knowledge of the SmartFOAM system and Trident Air Primer as found on the Pierce Enforcer. As available, a modified test will include use of props or other visual aids.

Task	Value	Score
<b>Walk Around</b>		
1. Position the engine on a reasonably level stable surface.	1	
2. Apply parking brake, turn engine off and place wheel chock on the downhill side of the front or rear tire. <b>(CFP)</b>	1	
3. Ensure all discharge caps and intake plugs are present and secure.	1	
4. Open all bleeders and drains.	1	
5. Exercise gate valves used for tank fill, tank to pump, and all pre-connected hoselines. Lubricate gate valves and lever linkages as necessary.	2	
6. Close all bleeders and drains.	1	

Task	Value	Score
<p>7. Inspect all hose loads for the following: <b>(CFP)</b></p> <ul style="list-style-type: none"> <li>a) proper length/amount of hose</li> <li>b) load configuration, proper ear lengths, stability of stacks</li> <li>c) nozzle patterns adjusted to straight stream</li> <li>d) nozzle bales closed</li> <li>e) no obvious damage to nozzles or hose</li> <li>f) secure retention nets/flaps</li> </ul>	2	
<p>8. Candidate will verbalize the following for each separate hose load on the apparatus as applicable: <b>(CFP)</b></p> <ul style="list-style-type: none"> <li>a) total length</li> <li>b) hose diameter</li> <li>c) nozzle type</li> <li>d) smooth bore diameter, including slug tips</li> <li>e) rated nozzle flow</li> <li>f) rated nozzle pressure</li> <li>g) product capabilities (water, solution, CAFS)</li> </ul>	5	
<p>9. Inspect Humat Valve and accessory hydrant wrench. Inspect LDH Siamese. Ensure both appliances are properly secured.</p>	1	
<p>10. Inspect all exterior compartments for correct contents and condition of items. Candidate will display a thorough knowledge of inventory prior to opening each compartment.</p>	2	
<p>11. Fire Pump Primer – Candidate will:</p> <ul style="list-style-type: none"> <li>a. Explain the principles of Primer Pump operation <ul style="list-style-type: none"> <li>• Exhausts air from pump and intakes so pressure inside the pump is lower than outside atmospheric pressure</li> <li>• Water flows from higher pressure into lower pressure area inside the fire pump</li> </ul> </li> <li>b. Inspect the visible mechanical components of the primer system</li> <li>c. Ensure primer discharge orifice is not obstructed</li> <li>d. Explain possible causes of weak primer suction. Identify location of air primer integral strainer and explain how to inspect and clear debris</li> <li>e. Articulate the principles and functional differences between rotary vane and air primers <ul style="list-style-type: none"> <li>• rotary vane 45 seconds operation, air primer continuous operation</li> <li>• rotary vane draws electric power; air primer is supplied by chassis air</li> </ul> </li> <li>f. Explain operating parameters and situations where “Auto” setting of air primer will activate <ul style="list-style-type: none"> <li>• Internal pump pressure &lt; 20psi</li> <li>• Air slug from interruption in water supply</li> <li>• Discharge opened too quickly</li> <li>• Transition from tank water to external source</li> </ul> </li> <li>g. Explain methods for priming individual intakes for each type of priming system and any precautions required <ul style="list-style-type: none"> <li>• Air Primer – individual manual actuators; intake bleeders should be opened and/or preconnected soft sleeves must be removed before testing</li> <li>• Rotary Vane – selector at pump panel</li> </ul> </li> </ul>	10	

Task	Value	Score
12. Inspect the Gearbox Assembly. Candidate will explain the purpose of the Gearbox Assembly.	2	
13. Verify all relief valve discharges are secure, free of debris, and not capped.	1	
14. Verify that all discharge valves are closed prior to placing pump in gear. <b>(CFP)</b>	1	
15. Candidate will address the following CAFS features: a. Check fluid level in CAFS air compressor fluid reservoir. Oil must be cool and not frothy. b. Candidate will verbalize the corresponding manifold for each discharge. Explain the volume capabilities and product capabilities associated with each manifold. c. Candidate will identify the manifold associated with the tank fill and pump cooler. d. Inspect Water/Oil Heat Exchanger and check strainer for debris e. Describe the purpose and mechanics of the Water/Oil Heat exchanger	8	
<b>Pump Engaged</b>		
16. Start vehicle motor and view gauges for operation and normal readings.	1	
17. Engage pump. Candidate will identify various indicators of pump engagement. <ul style="list-style-type: none"> <li>• “Ok to Pump” and “Pump Engaged” indicators</li> <li>• Pump panel gauges illuminated</li> <li>• Positive discharge pressure on master discharge gauge</li> <li>• Mechanical sound of pump shift</li> <li>• Change to vehicle speedometer</li> <li>• All four driver’s side panel lights are illuminated on Pierce Enforcer (only 3 are lit when pump is disengaged)</li> <li>• CAFS compressor and foam system engaged on Crimson</li> </ul>	1	
18. Candidate confirms the following at the pump panel: a) Pump panel gauges are illuminated, b) Positive discharge pressure on the Master Discharge Gauge, and c) “Tank To Pump” is open d) CAFS Engine: air compressor is on and producing pressure (red needle)	1	
19. Candidate will manage pump temperature throughout checkout. <b>(CFP)</b> <ul style="list-style-type: none"> <li>• Open “Pump Cooler” or “Re-circulating line”</li> <li>• Partially open “Tank Fill”</li> </ul>	1	
20. Exercise the “Tank to Pump” valve. Verifying manual linkage or air actuated piston is operating.	1	

<p>21. Candidate will demonstrate or describe the operating characteristics, controller functions, and capabilities of the Class A foam systems commonly found on MCFR apparatus.</p>	<p>10</p>	
<p><u>CAFS Pro Controller</u></p> <p>a) Identify the three modes of operation and parameters for selecting each</p> <ul style="list-style-type: none"> <li>• Standby – not currently needed, but may need; closes air injection valve</li> <li>• Off – no expectation of using CAFS; &gt;150psi PDP; motor must be at idle; must take pump out of gear to restart</li> <li>• On – default setting when pump is engaged</li> </ul> <p>b) Verbalize the four functions monitored</p> <ul style="list-style-type: none"> <li>• Air Flow in CFM, Air to Water Injection Ratio, Compressor Temperature, Compressor Hours</li> </ul> <p>c) Check the four functions for error codes</p> <p>d) Verbalize the air ratio ranges for wet, fluid, and dry CAFS foam</p> <ul style="list-style-type: none"> <li>• wet = 0.5 to 1.5; fluid = 2.0 to 3.0; dry = 11</li> </ul> <p>e) Verbalize the settings for the compressor overheat alarm (205°F)</p> <p>f) Verbalize the settings for compressor auto-shutoff (220°F)</p> <p>g) Identify which discharges are capable of Compressed Air Foam</p> <p><u>FoamLogix Controller</u></p> <p>a) Verbalize the four functions monitored</p> <ul style="list-style-type: none"> <li>• Current Product Flow in GPM Through Manifold, Current % Foam Injection Rate, Total Water Flowed in Current Session, Total Class A Foam Concentrate used in Current Session</li> </ul> <p>b) Interpret the LED bar graph on the controller</p> <ul style="list-style-type: none"> <li>• No LED = Off, 1 LED = On, All LEDs = Max of 5 GPM Foam Injection</li> </ul> <p>c) Identify which discharges are capable of flowing foam solution</p>		
<p><u>SmartFOAM Controller</u></p> <p>a) Identify pump parameters required for foam injection</p> <ul style="list-style-type: none"> <li>• Pump discharge pressure &lt; 200psi</li> <li>• Current pump flow &gt; 20gpm</li> </ul> <p>b) Identify and explain uses and settings for the four preset operating modes (assuming FoamLogix 5.0 pump)</p> <ul style="list-style-type: none"> <li>• Attack - 0.3% default up to 1,667 gpm</li> <li>• Overhaul - 0.5% default up to 1,000 gpm</li> <li>• Brush - 0.1% default up to 5,000 gpm</li> <li>• Training - 0.1% default up to 5,000 gpm</li> </ul> <p>c) Explain how to activate foam pump and adjust injection settings</p> <p>d) Explain the information available in all controller menu fields</p> <p>e) Identify location, default setting, and purpose of foam pump bypass valve</p> <ul style="list-style-type: none"> <li>• Located behind the access door on the driver's side pump panel</li> <li>• Normally kept in the "inject" position</li> <li>• "Bypass" is used to prime the foam pump, during foam pump calibration, or when emptying the foam tank</li> </ul> <p>f) Identify location of in-line strainer, how to clean it, and the normal maintenance schedule</p> <ul style="list-style-type: none"> <li>• Located behind the officer side pump panel near Large Diameter Discharge B</li> <li>• Rinse strainer with clean water</li> <li>• Should be cleaned every month, or as indicated by display prompts</li> </ul> <p>g) Identify which discharges are capable of flowing foam solution</p> <ul style="list-style-type: none"> <li>• Both crosslays and all four rear discharges</li> </ul>		

<p>25. Candidate will demonstrate the operational check of the Hale Total Pressure Master (TPM). <b>(CFP)</b></p> <ol style="list-style-type: none"> <li>a) Adjust relief above 150psi,</li> <li>b) Increase pump pressure to 150psi,</li> <li>c) Reduce relief setting until valve opens and pilot light illuminates; note drop on master pressure gauge; activating at the correct pressure?</li> <li>d) Increase relief setting until pilot light goes out and master pressure gauge should increase; deactivating at the correct pressure?</li> <li>e) Reset the relief setting to zero at completion</li> </ol>	2	
<p>26. With TPM set just above 100psi, throttle up to generate 100psi discharge pressure and observe the Master Discharge Gauge for proper tracking of water pressure. CAFS engines also verify tracking of air pressures.</p>	1	
<p>27. If equipped, place the CAFS Pro controller in standby mode followed by off. Turn the FoamLogix pump off.</p>	1	
<p>28. Candidate will verify operation of the fire pump and intake primer system.</p> <ol style="list-style-type: none"> <li>a) Ensure intake bleeders are open and/or preconnected soft sleeves are removed before testing. <b>(CFP)</b></li> <li>b) Candidate will verify individual intake primers are functional via the 4-way priming selector or individual manual air primer</li> <li>c) Candidate will explain the configuration and purpose of the individual intake primers</li> <li>d) Rotary vane primers should not be bump tested nor run continuously for &gt;45 seconds</li> </ol>	4	
<p>29. Verify the air horn switch functions at the pump panel.</p>	1	
<p>30. Candidate will describe the purpose of the Direct Tank Fill in CAFS operations and limitations associated with its use.</p> <ul style="list-style-type: none"> <li>• Manages intake pressure to allow necessary RPM for compressor</li> <li>• 2 ½" pipe limits water supply to tank; operating from tank limits GPM</li> <li>• Requires 10psi intake pressure to operate</li> </ul>	1	
<p>31. Candidate will demonstrate or describe exercising and inspection of the Direct Tank Fill (Auto Fill) on CAFS Engines.</p> <ol style="list-style-type: none"> <li>a) disconnect the rear intake hose</li> <li>b) set the Auto Fill to "manual" mode</li> <li>c) open the Auto Fill. Note the valve status light changes to green indicating open.</li> <li>d) return the Auto Fill to "auto" mode</li> <li>e) ensure the valve status light changes to red indicating closed.</li> </ol>	1	

<p>32. Pump Panel Discharge Gauge Calibration Check - Candidate will do the following in the order shown:</p> <ol style="list-style-type: none"> <li>a) adjust TPM to just above 150psi.</li> <li>b) engage main pump primer until water discharges beneath the truck</li> <li>c) ensure all pump panel discharges are securely capped <b>(CFP)</b></li> <li>d) charge the pump panel discharges</li> <li>e) adjust pump discharge pressure to 150psi</li> <li>f) compare the readings on the Master Discharge gauge and individual discharge gauges <ul style="list-style-type: none"> <li>• variations greater than 10psi are reported as a defect.</li> </ul> </li> <li>g) return throttle to idle</li> <li>h) close all discharges</li> <li>i) open appropriate bleeders to relieve pressure on the discharges <b>(CFP)</b></li> <li>j) adjust TPM to zero</li> </ol>	3	
<p>33. Candidate will verify the presence of necessary knobs or wrenches and demonstrate the operation of large diameter discharge and intake manual overrides.</p>	1	
<p><b>Pump Disengaged</b></p>		
<p>34. Master Intake Valves, the candidate will:</p> <ol style="list-style-type: none"> <li>a) Remove each intake cap</li> <li>b) Open and close each MIV using the switch at the pump panel and verify the valve operated.</li> <li>c) Account for each manual override knob.</li> <li>d) Visually inspect each intake screen and explain purpose of screens. <ul style="list-style-type: none"> <li>• prevent debris from entering the pump; sacrificial anode to reduce corrosion of internal pump components</li> </ul> </li> </ol>	3	
<p>35. Candidate will demonstrate or describe the blowout for a booster reel.</p> <ul style="list-style-type: none"> <li>• Utilizes chassis air supply to push water out of the booster hose, reel, and nozzle</li> <li>• Most effective when hose is fully extended from the reel</li> <li>• Must be used during freezing weather to avoid damage to the reel plumbing and nozzle</li> <li>• Nozzle must be secured to prevent whipping during air evacuation</li> </ul>	2	
<p>36. Candidate will verify or describe that the CAFS manifold automatically flushes by discharging solution to the ground.</p>	1	
<p>37. Candidate will identify the levels or quantities of foam concentrate onboard and the method of storage for each type of concentrate.</p>	2	
<p>38. Candidate will describe the procedure for refilling/resupplying all foam concentrate supplies applicable to their apparatus.</p>	1	
<p>39. Candidate will verify the onboard water tank level and compare it to the levels indicated at the pump panel and any auxiliary indicators on the apparatus.</p>	2	

40. Inspect and manipulate the deck gun. Candidate will verbalize the tip sizes and associated flows for each. <ul style="list-style-type: none"> <li>• 1 3/8", 1 1/2", 1 3/4", 2"; 500gpm, 600gpm, 800gpm, 1000gpm</li> </ul>	2	
41. Candidate will ensure the availability of the deck gun base and demonstrate conversion of the deck gun into a ground-based master stream. Candidate will articulate the nozzle pressure required to the base. (90 psi)	1	
<b>Prepare Engine for Service</b>		
42. CAFS Engine: Following each pump engagement, inspect and clean as necessary the strainer in the Water/Oil Heat Exchanger.	1	
43. Remove all discharge caps and intake plugs to drain water. Secure all caps and plugs. Verify connection of any preconnected attack or supply hose. Lubricate parts as necessary.	1	
44. Verify the following settings to ready the Engine for service: <ul style="list-style-type: none"> <li>a) throttle is at idle</li> <li>b) TPM is at zero</li> <li>c) Pump Cooler is open</li> <li>d) Engine Cooler is closed</li> <li>e) water tank is full</li> </ul>	2	
<b>Weekly Maintenance</b>		
45. Candidate will verbalize the sequence to exercise and verify operation of the TPM external relief valve. The sequence is as follows: <ul style="list-style-type: none"> <li>a) Establish a pressurized water source via MIV</li> <li>b) Adjust TPM to approximately 200psi</li> <li>c) Increase discharge pressure to 150psi</li> <li>d) Decrease TPM setting until the external relief valve discharges water to the ground. Verify that the orange indicator light is flashing.</li> <li>e) Increase the TPM setting until the external relief valve closes.</li> <li>f) Reduce throttle to idle and close the MIV. Zero the TPM.</li> </ul>	2	
46. Lubricate all threads and Storz caps on intakes and discharges.	1	
47. Candidate will verbalize the procedure to back flush the pump. See PAGS for Back Flush Centrifugal Pump. Back flushing will also occur following drafting operations.	1	
48. Candidate will verbalize the sequence to exercise and verify operation of the Auto Fill on a CAFS Engine. The sequence is as follows: <ul style="list-style-type: none"> <li>a) ensure Auto Fill switch is in the "Automatic" position.</li> <li>b) establish a pressurized water source to the rear MIV</li> <li>c) open a discharge to flow water from the water tank</li> <li>d) observe that Auto Fill valve maintains the water tank level throughout (valve opens at 3/4 and closes at 7/8)</li> </ul>	2	

<p>49. Candidate will verbalize the sequence to exercise and verify operation of the Outboard Relief Valves on Officers High Flow discharges on an MCFR Crimson Engine. The sequence is as follows:</p> <ul style="list-style-type: none"> <li>a) Adjust TPM to approximately 220psi</li> <li>b) Establish a pressurized water source via MIV</li> <li>c) Ensure High Flow Discharges are capped</li> <li>d) Open "Officers No.1" discharge</li> <li>e) Increase discharge pressure until water discharges to the ground from the discharge relief valve. Note the pressure on the discharge gauge. (<b>factory set at 185psi; should be ≈ 210psi; do not field-adjust</b>)</li> <li>f) Reduce throttle to idle. Close discharge valve and open bleeder. (<b>CFP</b>)</li> <li>g) Repeat steps for "Officers No.2" discharge.</li> </ul>	2	
<b>Monthly Maintenance</b>		
<p>50. Candidate will demonstrate a working knowledge of lubrication of the following valves:</p> <ul style="list-style-type: none"> <li>a) CAFS Air Compressor</li> <li>b) Auto Tank Fill</li> <li>c) LDH Discharge</li> <li>d) Tank to Pump</li> </ul> <p>Candidate will explain what grease to use, how much grease to inject, what position the valve should be in while injecting the grease, and the steps to exercise each individual valve.</p>	2	
<p>51. Candidate will verbalize the procedures for flushing the Class B foam system on an MCFR Crimson Engine. The procedure is as follows:</p> <ul style="list-style-type: none"> <li>a) Flush hose and eductor with plain water.</li> <li>b) Flush piping by attaching a garden hose to the pump panel fitting and flowing plain water.</li> </ul>	2	
<p>52. Candidate will verbalize the procedures for draining water from the CAFS air compressor oil reservoir on an MCFR Crimson Engine.</p>	1	
<b>Total Points</b>	100	

## **Critical Fail Points**

*Failure to successfully perform any of the following components will result in an automatic failure of this evolution regardless of total score.*

- a) Failure to use wheel chock
- b) Activation of TRV or overheating of any components
- c) Failure to ensure discharge caps are secured before pressurization
- d) Failure to relieve pressure from discharges following testing
- e) Unintended charging of any preconnected hose loads (exception: mechanical failure of discharge valves or seals)
- f) Improper testing of the TPM at any stage
- g) Improper sequencing of steps that result in incomplete testing of functions or components
- h) Failure to ensure all equipment is secured to the apparatus
- i) Failure to ensure proper hose and appliance configurations
- j) Failure to correctly explain hose loads, nozzles, and product capabilities of hose and preconnected hoselines
- k) Failure to ensure intake bleeders are opened and/or preconnected soft sleeves are removed before testing fire pump primer

**Evaluator: Initial beside the final outcome of the exam below.**

\_\_\_\_\_ **PASS**    \_\_\_\_\_ **FAIL – Overall Points**    \_\_\_\_\_ **FAIL – Critical Failure Point**

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**Evaluator Name**

\_\_\_\_\_  
**Date**

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\_\_\_\_\_  
**Evaluator Signature**